

AEROLOGICAL OBSERVATIONS

By W. R. STEVENS

Free-air temperatures for March were slightly below normal at Due West and Royal Center, and were mostly above at Broken Arrow, Ellendale, Groesbeck, and Washington. Highest March temperatures of record for various levels occurred at Broken Arrow, Ellendale, and Groesbeck, and lowest March temperatures of record at Broken Arrow, Due West, and Groesbeck.

Relative humidities and vapor pressures were near normal.

From the surface to 1,000 meters, resultant winds were of northerly component north of the latitude of St. Louis and east of the longitude of Salt Lake City. Above this altitude the area over which winds of southerly component prevailed gradually diminished with height and finally disappeared entirely at 5,000 meters.

Easterly winds at high levels were reported at various balloon stations west of the Mississippi River from the 17th to the 21st. As is usually the case with this condition, there was a notable lack of cyclonic activity over this area during that period.

Sounding balloons were released at 12 stations distributed over the southern half of the country at 8 p. m. of the 14th, and 8 a. m. and 8 p. m. of the 15th (75 meridian time). During this period special observations were made at all the kite and balloon stations. Airplane flights were obtained at five stations through cooperation with the Navy. These observations were made for the purpose of making a special study of cyclonic convection in the South and a detailed report will be made at a later date.

A kite ascent of special interest was obtained at Royal Center on the morning of the 26th when that station was under the influence of a low of marked intensity central at 8 a. m. over Springfield, Ill. Its movement east-northeastward was attended by numerous thunderstorms from the Lake region southward to Florida. At the beginning of the flight there was a large temperature inversion from the surface to 765 meters and a drop in relative humidity from 97 to 24 per cent. Before the end of the flight, however, there had been a rise in temperature at the surface, importation of colder air aloft, and an increase in relative humidity to nearly saturation. Aerological records show that thunderstorms are very frequently preceded by an importation of colder air aloft which aids in establishing the instability necessary for their genesis.

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during March, 1928

Altitude M. S. L. (meters)	TEMPERATURE (°C.)											
	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		Washing- ton, D. C. (7 meters) ¹	
	Mean	De- parture from 10-yr. mean	Mean	De- parture from 8-yr. mean	Mean	De- parture from 11-yr. mean	Mean	De- parture from 10-yr. mean	Mean	De- parture from 10-yr. mean	Mean	De- parture from 3-yr. mean
Surface..	9.6	-0.3	10.6	-1.4	1.0	+3.2	14.4	+1.1	3.3	-0.7	9.4	+3.0
250.....	9.5	-0.3	10.3	-1.4	0.8	+3.2	13.7	+1.0	3.1	-0.7	7.2	+2.3
500.....	8.7	+0.6	8.8	-1.1	0.8	+3.2	12.6	+1.1	1.2	-0.6	5.2	+1.6
750.....	7.8	+0.9	7.8	-0.7	-0.5	+2.7	12.1	+1.5	-0.1	-0.7	3.7	+1.2
1,000.....	6.9	+0.9	6.7	-0.6	-2.0	+1.7	11.7	+1.7	-0.7	-0.6	2.7	+1.3
1,250.....	5.8	+0.5	5.3	-0.8	-2.7	+1.6	10.9	+1.5	-1.2	-0.5	1.8	+1.6
1,500.....	4.8	+0.2	4.1	-0.8	-3.5	+1.4	10.2	+1.4	-1.7	-0.3	1.0	+1.8
2,000.....	2.7	-0.2	2.1	-0.6	-5.4	+1.2	8.0	-0.6	-4.1	-1.1	-1.4	+1.4
2,500.....	0.5	-0.1	-0.4	-0.9	-8.4	+0.6	5.0	-0.2	-6.6	-1.4	-3.7	+1.1
3,000.....	-2.0	-0.1	-3.3	-1.6	-11.6	+0.1	1.8	-0.8	-9.3	-1.7	-5.3	+1.9
3,500.....	-4.1	+0.3	-3.6	-0.5	-14.6	-0.2	-1.7	-1.5	-11.6	-1.6	-----	-----
4,000.....	-6.1	+1.1	-----	-----	-17.4	-0.3	-5.3	-2.1	-14.3	-1.7	-----	-----
4,500.....	-9.3	-----	-----	-----	-21.8	-1.7	-9.3	-3.3	-18.9	-1.5	-----	-----
5,000.....	-----	-----	-----	-----	-26.0	-3.0	-----	-----	-----	-----	-----	-----

Altitude M. S. L. (meters)	RELATIVE HUMIDITY (%)											
	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		Washing- ton, D. C. (7 meters) ¹	
	Mean	De- parture from 10-yr. mean	Mean	De- parture from 8-yr. mean	Mean	De- parture from 11-yr. mean	Mean	De- parture from 10-yr. mean	Mean	De- parture from 10-yr. mean	Mean	De- parture from 3-yr. mean
Surface..	64	0	62	-1	62	-10	69	-1	70	-1	61	-4
250.....	64	0	61	-2	61	-10	70	+1	70	-1	63	-2
500.....	59	-4	58	-4	61	-10	70	+3	70	0	64	-1
750.....	56	-6	58	-3	69	-8	66	-2	66	-2	62	-1
1,000.....	54	-7	57	-4	59	-4	61	-1	61	-3	61	-1
1,250.....	52	-6	58	-3	58	-3	56	0	55	-6	61	-1
1,500.....	50	-4	55	-5	56	-1	55	+3	49	-8	59	-2
2,000.....	48	-1	51	-5	52	-3	49	-6	46	-8	54	-2
2,500.....	45	+2	48	-3	50	-5	48	-9	48	-5	53	+1
3,000.....	43	+2	43	-2	51	-5	50	+13	51	-2	59	+10
3,500.....	44	+5	27	-15	49	-6	51	+15	50	-1	-----	-----
4,000.....	46	+8	-----	-----	39	-14	53	+15	51	+1	-----	-----
4,500.....	48	+11	-----	-----	43	-9	54	+14	56	+3	-----	-----
5,000.....	-----	-----	-----	-----	55	+3	-----	-----	-----	-----	-----	-----

Altitude M. S. L. (meters)	VAPOR PRESSURE (mb.)											
	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		Washing- ton, D. C. (7 meters) ¹	
	Mean	De- parture from 10-yr. mean	Mean	De- parture from 8-yr. mean	Mean	De- parture from 11-yr. mean	Mean	De- parture from 10-yr. mean	Mean	De- parture from 10-yr. mean	Mean	De- parture from 3-yr. mean
Surface..	7.66	-0.52	8.23	-1.21	4.03	+0.16	11.47	+0.05	5.78	-0.40	8.20	+1.13
250.....	7.66	-0.54	8.14	-1.16	3.94	+0.18	11.12	+0.20	5.72	-0.36	7.32	+0.84
500.....	6.53	-0.64	7.18	-1.15	3.41	+0.15	10.34	+0.51	5.03	-0.22	6.54	+0.62
750.....	5.66	-0.79	6.58	-0.99	3.43	+0.15	9.37	+0.48	4.25	-0.43	5.87	+0.31
1,000.....	5.07	-0.88	6.23	-0.73	3.00	+0.05	8.39	+0.41	3.78	-0.43	5.15	+0.23
1,250.....	4.46	-0.92	5.69	-0.68	2.68	-0.01	7.36	+0.34	3.37	-0.43	4.83	+0.37
1,500.....	4.01	-0.78	4.93	-0.77	2.56	+0.07	6.97	+0.80	2.96	-0.47	4.39	+0.32
2,000.....	3.20	-0.47	3.77	-0.66	2.11	0.00	5.36	+0.89	2.51	-0.39	3.06	-0.02
2,500.....	2.63	-0.36	2.94	-0.37	1.57	-0.17	4.36	+0.92	2.18	-0.27	2.14	-0.14
3,000.....	1.94	0.38	2.20	-0.11	1.22	-0.17	3.65	+0.90	1.91	-0.20	1.83	+0.12
3,500.....	1.72	0.14	1.32	-0.34	0.77	-0.31	2.98	+0.74	1.49	-0.13	-----	-----
4,000.....	1.37	-0.04	-----	-----	0.32	-0.51	2.31	+0.40	1.23	-0.09	-----	-----
4,500.....	0.77	-0.30	-----	-----	0.00	-0.65	1.70	-0.04	1.11	-0.02	-----	-----
5,000.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

¹ Naval Air Station, Washington, D. C.

TABLE 2.—Free-air resultant winds (m. p. s.) during March, 1928

Altitude m. s. l. (meters)	Broken Arrow, Okla. (233 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)				Washington, D. C. (34 meters)			
	Mean		10-year mean		Mean		8-year mean		Mean		11-year mean		Mean		10-year mean		Mean		10-year mean		Mean		8-year mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Surface..	S. 5 W.	0.1	S. 17 W.	1.7	N. 86 W.	1.6	S. 72 W.	1.7	N. 35 W.	2.1	N. 43 W.	2.0	S. 50 W.	0.5	S. 6 E.	0.9	S. 85 W.	2.2	S. 54 W.	1.7	N. 64 W.	1.9	N. 49 W.	1.6
250.....	S. 22 W.	1.8	S. 16 W.	1.9	S. 86 W.	1.7	S. 74 W.	1.8	N. 43 W.	2.2	N. 47 W.	2.0	S. 11 W.	0.8	S. 8 E.	1.5	S. 83 W.	2.5	S. 49 W.	1.8	N. 76 W.	4.3	N. 77 W.	3.3
500.....	S. 42 W.	1.8	S. 20 W.	3.0	S. 86 W.	2.6	S. 74 W.	3.0	N. 43 W.	2.2	N. 47 W.	2.0	S. 26 W.	2.0	S. 8 W.	3.0	S. 84 W.	5.0	S. 58 W.	4.1	N. 74 W.	7.1	N. 76 W.	5.2
750.....	S. 94 W.	1.0	S. 28 W.	3.7	N. 86 W.	3.1	S. 77 W.	4.1	N. 47 W.	3.5	N. 64 W.	2.6	S. 28 W.	2.7	S. 21 W.	3.6	S. 89 W.	6.4	S. 64 W.	5.3	N. 63 W.	9.0	N. 71 W.	6.3
1,000.....	S. 85 W.	1.6	S. 37 W.	4.3	N. 83 W.	4.8	S. 76 W.	5.4	N. 53 W.	4.4	N. 73 W.	3.2	S. 37 W.	3.5	S. 35 W.	4.3	N. 87 W.	7.2	S. 70 W.	6.0	N. 71 W.	10.2	N. 68 W.	7.1
1,250.....	N. 73 W.	1.7	S. 52 W.	4.9	N. 81 W.	7.0	S. 77 W.	6.7	N. 61 W.	5.4	N. 71 W.	4.0	S. 68 W.	4.5	S. 47 W.	4.8	N. 85 W.	8.4	S. 77 W.	7.2	N. 71 W.	11.9	N. 67 W.	8.8
1,500.....	N. 81 W.	2.5	S. 67 W.	5.4	N. 81 W.	8.2	S. 79 W.	8.4	N. 61 W.	6.0	N. 74 W.	5.1	S. 73 W.	5.8	S. 62 W.	5.3	N. 81 W.	9.9	S. 83 W.	8.2	N. 71 W.	12.0	N. 67 W.	10.3
2,000.....	N. 80 W.	4.2	S. 80 W.	6.6	N. 80 W.	12.2	S. 83 W.	10.9	N. 64 W.	6.9	N. 74 W.	6.9	S. 83 W.	7.6	S. 64 W.	6.6	N. 79 W.	12.3	S. 88 W.	9.8	N. 74 W.	13.0	N. 70 W.	10.3
2,500.....	N. 78 W.	6.1	W.	8.0	N. 80 W.	14.2	S. 89 W.	12.4	N. 71 W.	8.6	N. 74 W.	9.0	S. 82 W.	9.1	S. 68 W.	8.5	N. 77 W.	12.6	S. 89 W.	10.7	N. 72 W.	12.9	N. 67 W.	9.9
3,000.....	N. 88 W.	8.7	N. 89 W.	9.5	N. 72 W.	12.6	S. 86 W.	13.8	N. 70 W.	9.6	N. 75 W.	10.9	S. 78 W.	9.8	S. 72 W.	9.4	N. 72 W.	12.5	N. 86 W.	13.0	N. 82 W.	13.6	N. 73 W.	10.2
3,500.....	S. 73 W.	9.6	S. 81 W.	10.4	N. 65 W.	12.0	S. 87 W.	14.3	N. 77 W.	9.2	N. 81 W.	12.3	S. 78 W.	11.4	S. 76 W.	12.2	N. 69 W.	11.4	N. 88 W.	14.1	-----	-----	-----	-----
4,000.....	S. 49 W.	13.1	S. 76 W.	11.3	-----	-----	-----	-----	S. 86 W.	11.8	N. 88 W.	13.7	S. 80 W.	16.3	S. 71 W.	14.3	N. 68 W.	13.7	N. 88 W.	13.1	-----	-----	-----	-----
4,500.....	S. 53 W.	13.6	S. 67 W.	13.2	-----	-----	-----	-----	S. 82 W.	13.8	N. 88 W.	14.4	S. 77 W.	17.0	S. 81 W.	14.1	N. 42 W.	15.1	N. 82 W.	11.2	-----	-----	-----	-----
5,000.....	-----	-----	-----	-----	-----	-----	-----	-----	S. 46 W.	14.0	N. 88 W.	15.4	-----	-----	-----	-----	N. 32 W.	17.4	N. 83 W.	11.3	-----	-----	-----	-----